CONTROL OF POTATO DISEASES IN NEWFOUNDLAND

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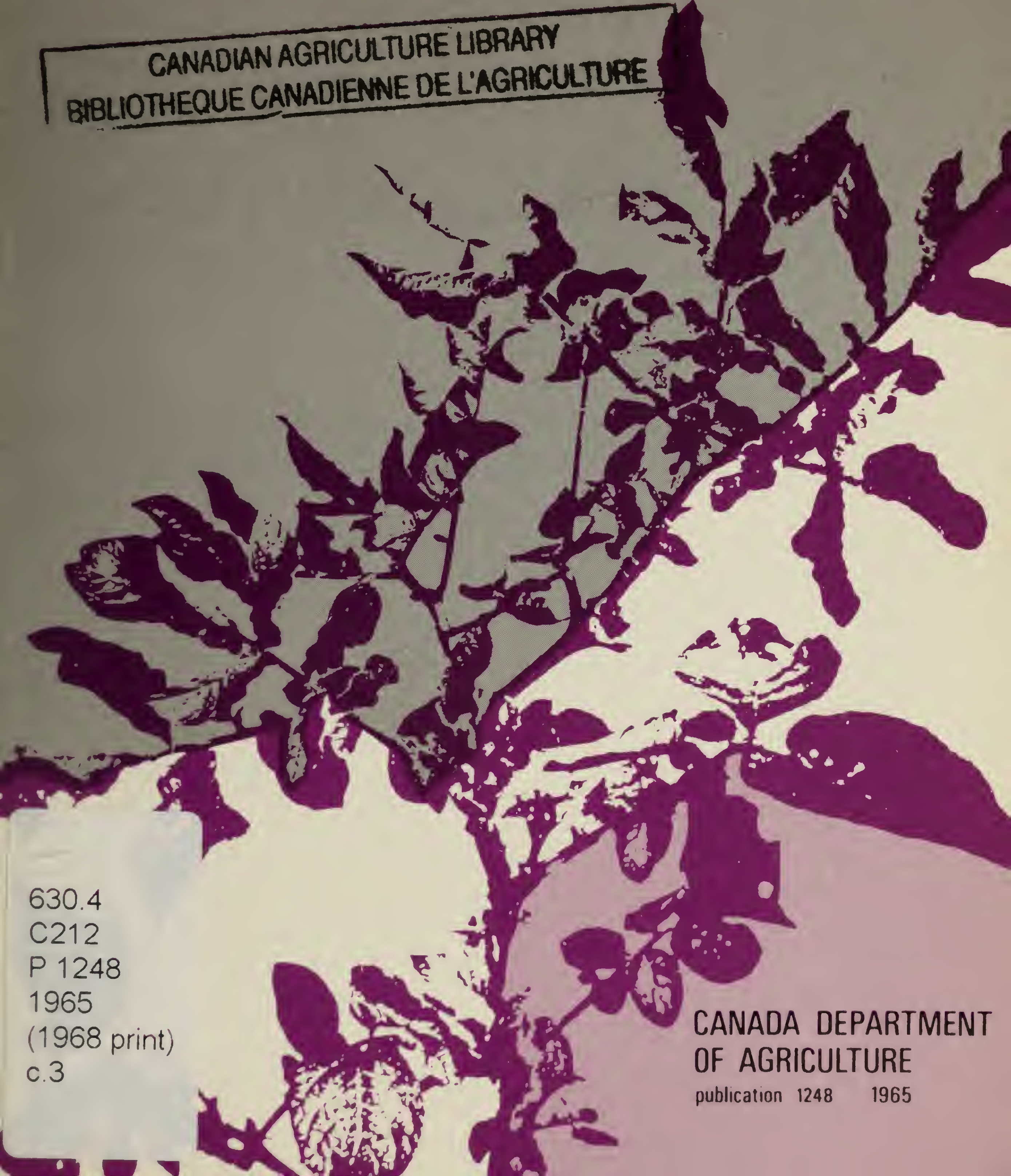

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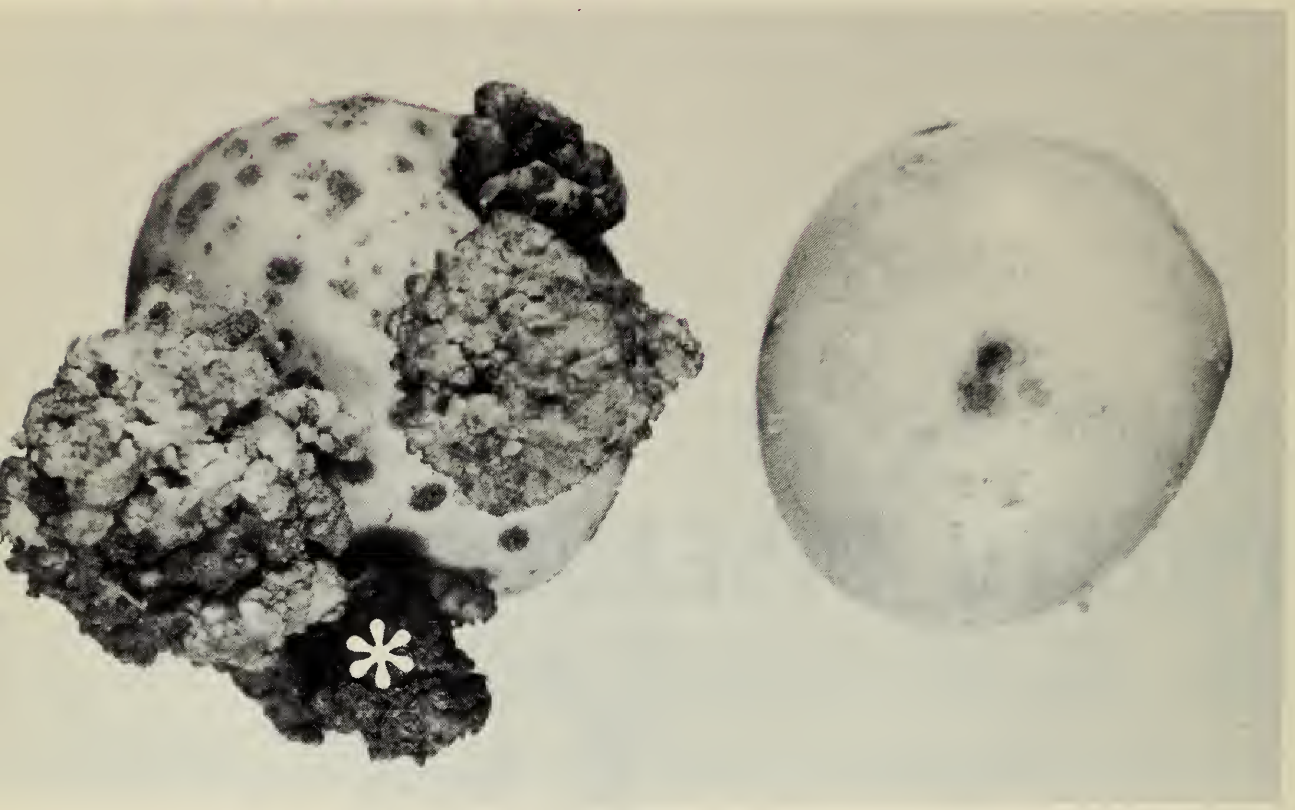
CONTROL OF POTATO DISEASES IN NEWFOUNDLAND

PLANT PROTECTION DIVISION - OTTAWA

Potato wart, or canker, is the most destructive disease of potatoes in Newfoundland. The golden nematode is a potentially dangerous pest but, if properly controlled, it need never impair potato production. Other important diseases or conditions of potatoes in Newfoundland are bacterial ring rot, blackleg, common scab, late blight, rhizoctonia and magnesium deficiency.

POTATO WART



Potato wart is caused by a fungus, or very tiny plant, which can attack all growing parts of the potato plant except the roots. The fungus produces rough, warty outgrowths, or tumors, on the tubers and stem bases and sometimes on the leaves and flowers. The growths vary from the size of a small pea, with one or two on each tuber, to masses covering the whole potato. They are white or pinkish when covered with soil but turn green if they grow above ground.

Great numbers of spores, or seeds, of the fungus are released into the soil when the wart masses rot. The spores are very resistant to decay and may remain alive for as long as 12 years under continuous cultivation of crops other than potatoes, and 25 or more years under grassland.

The relatively cool summers and abundant rainfall of Newfoundland are ideal for the development of wart disease. Losses are especially high in wet seasons. Occasionally, if rainfall is well below average, there may be enough moisture to produce a good potato crop but not enough for good growth of the wart fungus, so that potato plants escape with very little infection.

where is potato wart found?

Though potato wart is found in many of the cultivated areas of Newfoundland, infections are relatively light in the southwest. Many fields near St. Georges and in the Port au Port peninsula area are infested but only a few in the Codroy

Valley and in the Corner Brook, Deer Lake and Cormack areas. Moderate to severe infestations have been noted on the Great Northern Peninsula, along the north coast and in central Newfoundland. The disease is severe on the Avalon, Bonavista and Burin peninsulas.

Crop losses are most serious in fields and small gardens where potatoes are grown continuously or very frequently in the rotation of crops.

control

If land is not infested with wart, take these precautions to keep it away:

1. *Plant only Certified or Newfoundland Approved seed potatoes* — These are guaranteed free from wart. Though good-looking potato tubers, apparently wart free, can be grown in wart-infested soil, such tubers always carry enough wart spores to infest any clean land in which they are planted and will produce a crop of warted potatoes.

2. *Disinfect equipment and use new bags* — Anything that carries soil, such as machinery, vehicles, tools and used bags, from infested fields can move potato wart spores onto clean land. *Always* wash soil from all pieces of equipment that you suspect may have been on wart-infested land; and spray equipment with a solution of 1 gallon of commercial formalin in 10 gallons of water before use. Always buy news bags for produce as second-hand bags may carry wart spores.

If land is infested with potato wart:

1. *Plant only wart-resistant varieties* — This is the most practical way to control wart. Most of the potato varieties popular in Newfoundland develop the disease but the following are resistant:

URGENTA, a light red to pink-skinned, yellow-fleshed potato with oblong tubers. Its yield is generally good. Cooking quality is good, especially in late winter, and its keeping quality is excellent. This variety has some resistance to late blight but is susceptible to blackleg.

SEBAGO, a white-skinned, flattened-oval, smooth tuber of acceptable quality. It gives a good yield but is very late. It has some resistance to scab and late blight but is susceptible to blackleg.

KENNEBEC, a white-skinned, oval, shallow-eyed tuber of fair to good eating quality. The variety yields heavily, matures late, and has resistance to late blight. Plants should be fairly close together and hilled thoroughly to avoid oversized or green tubers.

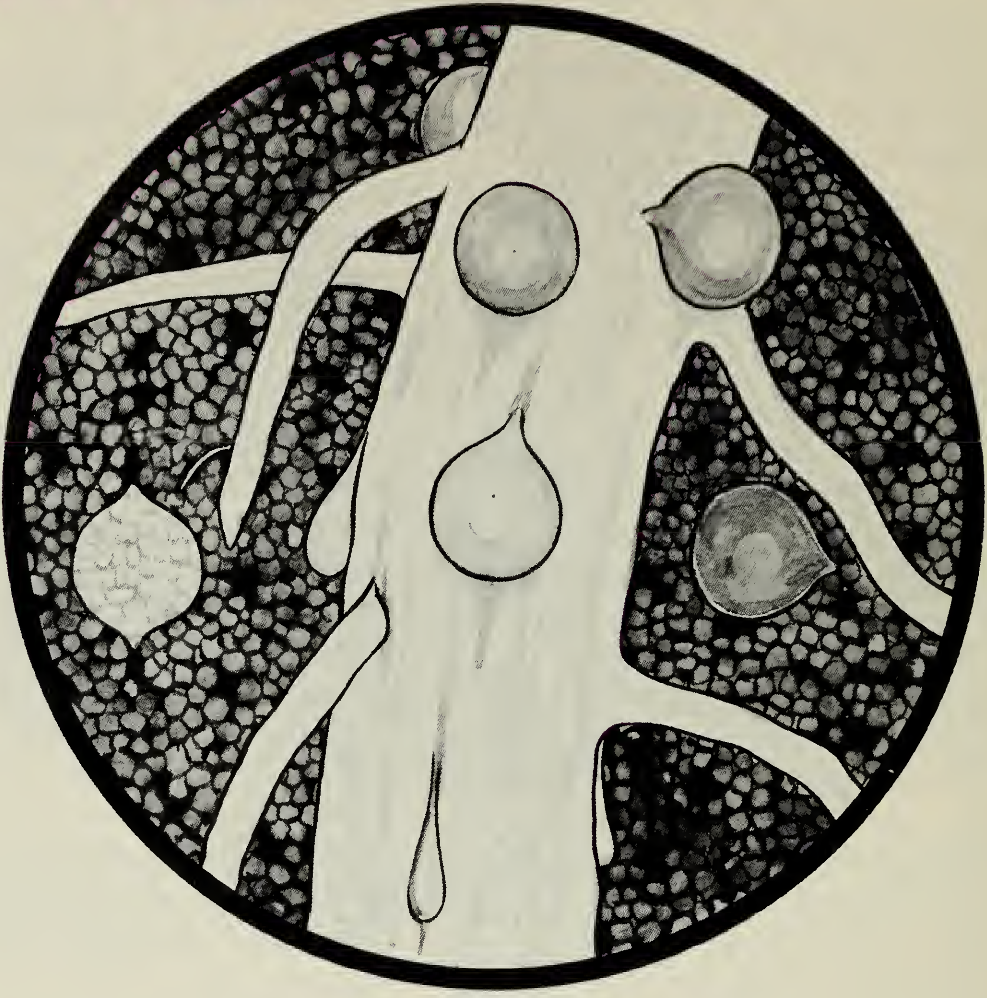
Certified or Newfoundland Approved seed of any of the above varieties will produce a crop of practically wart-free potatoes in heavily infested ground. Some wart may appear on the stem bases of Sebago and Kennebec but rarely on Urgenta.

2. *Practice crop rotations* — If at all possible, plant potatoes on the same land only once every five or six years. This helps to control wart but does not eradicate it. The other crops must be row crops, since the wart fungus persists better under grass than under crops requiring frequent cultivation.

3. *Report suspected fields* — If you suspect that your crop is infected with potato wart, send sample plants (roots and tubers) to:

Canada Department of Agriculture,
P.O. Box 5609, St. John's, Nfld.
or
Research Station,
P.O. Box 2068W, St. John's West, Nfld.

GOLDEN NEMATODE



The golden nematode, potato-root nematode, or potato-root eelworm, is a tiny wormlike animal that attacks and feeds on the roots of potato and tomato. In a severe nematode infection of the potato plant, the damage to the root system is enough to stunt the growth of the top and greatly reduce yield. Before infection becomes this heavy, the pest may be recognized by careful examination of the roots of apparently healthy plants just before or at harvest time. The nematodes appear on the fine roots as tiny round cysts about half the size of a pinhead. They range in color from pearly white through yellow and orange to red and brown. The cysts are the overwintering stage in the life cycle of the nematode and can live in the ground for many years even though potatoes are not grown.

where are nematodes found?

The golden nematode is widespread on the Avalon Peninsula, particularly around Conception Bay. Infestations have been found on the Bonavista and Burin peninsulas, in central Newfoundland and in the Bonne Bay area. They have been found only in gardens and smallfarm fields.

control

Potato varieties resistant to the golden nematode are not immediately available, but are being developed by potato breeders in Europe and the United States. Several promising varieties are under test at the Experimental Farm, St. John's.

In general, control measures similar to those effective against potato wart will control the golden nematode. If land is free from nematodes:

1. *Plant only Certified or Newfoundland Approved seed potatoes* — Nematode cysts can be carried on the surface of seed potatoes grown in infested soil.

2. *Disinfect equipment and use new bags* — Take the same sanitary measures against the introduction of infested soil on vehicles, machinery, equipment, used bags, etc., as for potato wart.

If land is infested:

1. *Plant resistant varieties in a crop rotation* — Peconic, a potato variety introduced by Cornell University, is immune to the strain of golden nematode most prevalent in Newfoundland. It is a white-skinned, white-fleshed, midseason potato, which produces fair yields of smooth, oval tubers. The cooking quality is acceptable. The variety is markedly susceptible to late blight tuber rot.

When Peconic is grown, nematodes of the common strain are reduced considerably, but other strains that exist in relatively low numbers increase more rapidly on Peconic than on susceptible varieties. Therefore, it should be alternated with a susceptible variety in a rotation in which potatoes are grown only once every four or five years.

2. *Plant early and fertilize adequately* — Early planting, where practicable, allows the potato root system to become established before nematode infection becomes heavy. A good supply of potato fertilizer, 1,800 to 2,000 pounds per acre, ensures vigorous growth.

3. *Report suspected fields* — If you suspect that your crop is infected with golden nematode, send sample potato plants (roots and tubers) to one of the addresses given on page 3.

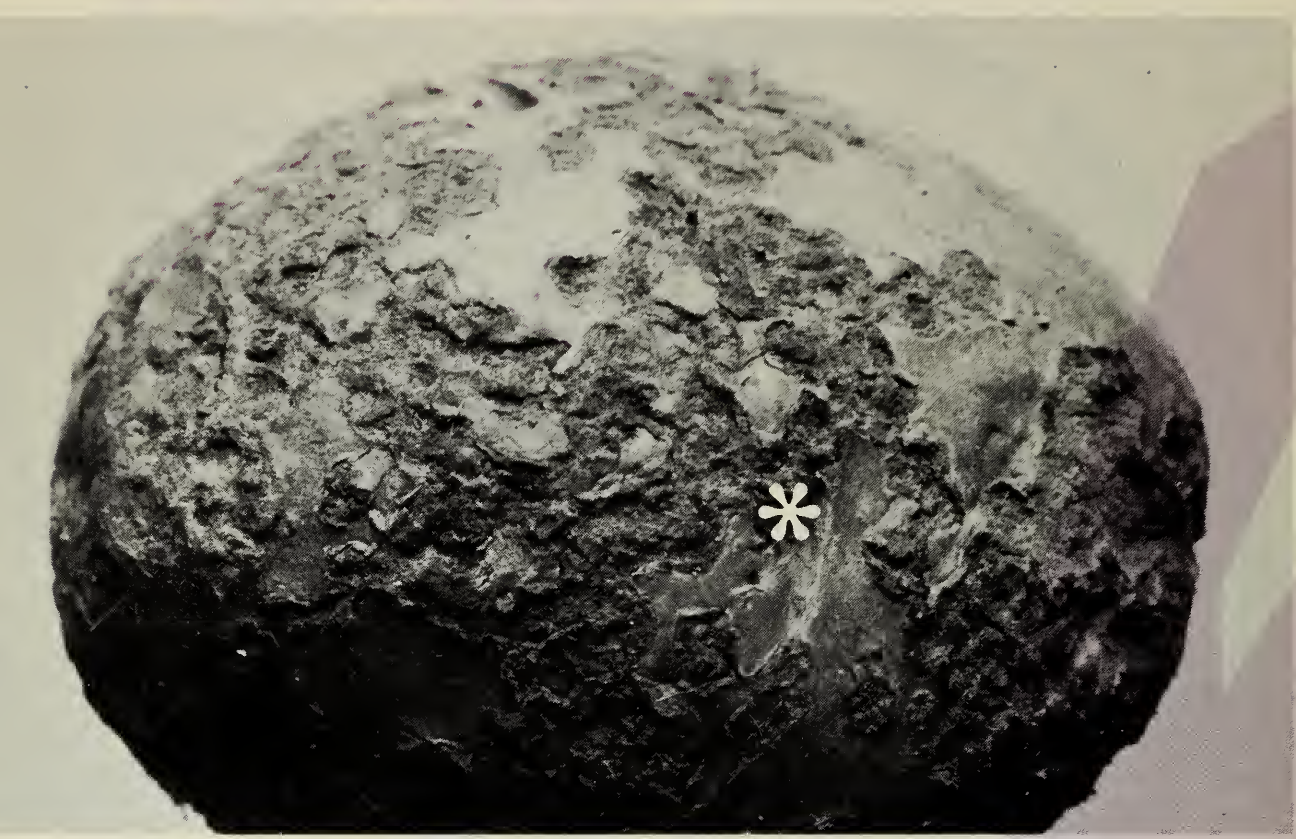
QUARANTINE

The potato industry in Canada is vitally important and export trade is extensive. Potato wart occurs only in Newfoundland, golden nematode has been found in Newfoundland and Vancouver Island. If either was introduced, particularly to Prince Edward Island or New Brunswick, many countries would place an embargo on Canadian potatoes.

Your cooperation is requested in preventing the introduction and spread of wart and golden nematode to points outside the province as well as in controlling them here. The present quarantine prohibits the following items from being taken out of the Province:

Potatoes
Root crops (turnips, carrots, etc.)
Soil
Plants with soil about the roots (includes potted house plants)
Used bags and burlap
Containers used in handling the above items.

COMMON SCAB



Though common scab has no effect on the flavor or quality of potatoes, it seriously affects the grade. This widespread disease of the skin and outer layers of the potato tuber is easily recognized by the areas of corky tissue, which vary from raised, very shallow lesions to pitted ones about ⅛ to ½ inch in diameter, are rounded but they often run together to form irregular scabby areas that cover a large part of the tuber surface. Scab does not penetrate deeply — it can be removed by heavy peeling — but the unattractive appearance of scabby potatoes usually makes them unsaleable.

control

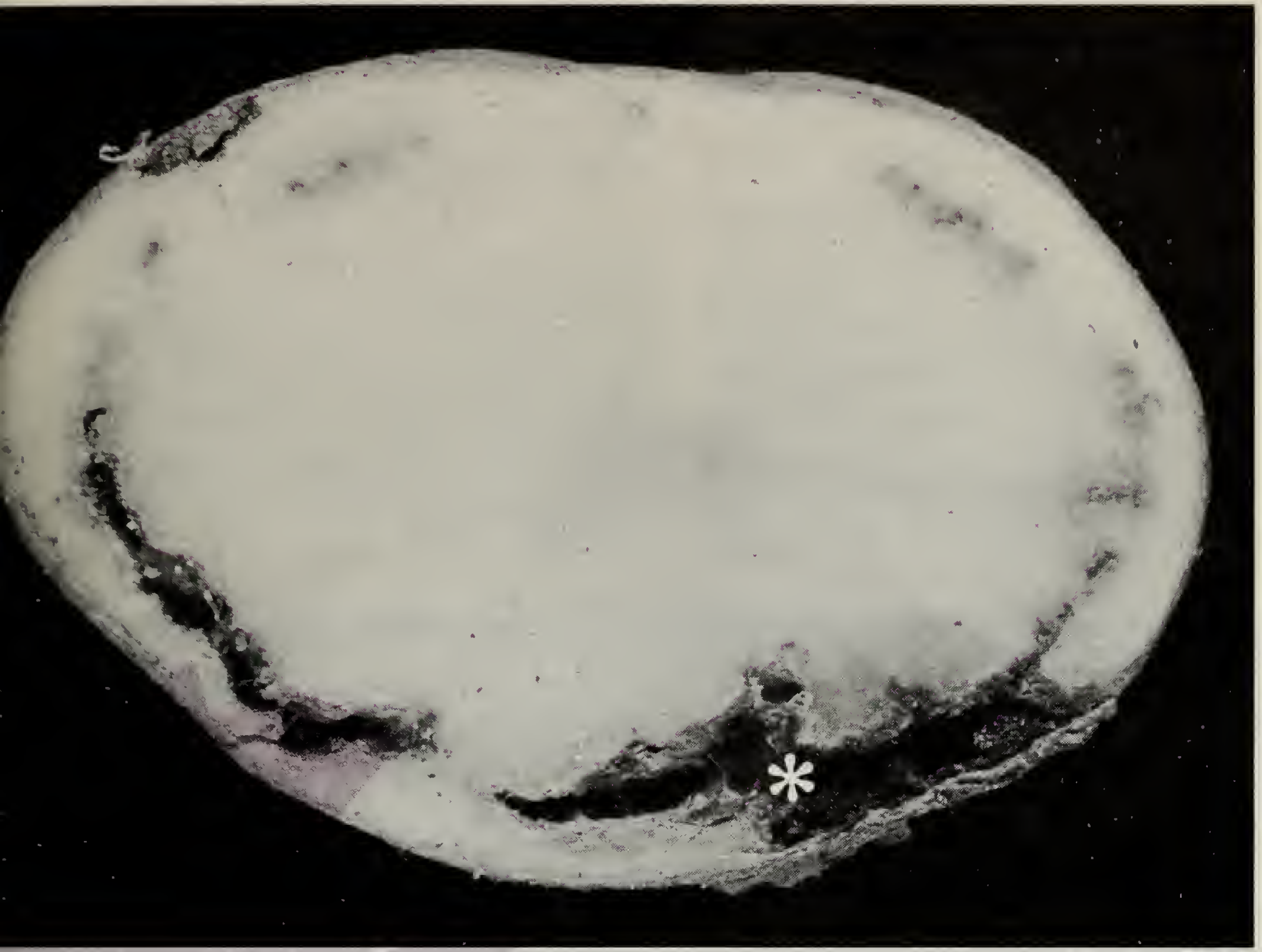
1. *Do not apply lime or fresh manure to the potato crop* — Common scab is hindered by acid soil; little or no scab develops at a pH of 5.0-5.2. As the pH rises to neutral and above, scab becomes more prevalent. Therefore, liming should be carefully planned and accompanied by soil testing to ensure that the soil is acid enough when potatoes are grown.

Apply only well-rotted barnyard manure to potato land, as fresh manure encourages scab development.

2. *Treat seed potatoes with Semesan Bel* — This kills scab organisms on the tubers but does not protect against scab already in the field.

3. *Plant resistant varieties* — Most of the recommended varieties are susceptible to scab but Avon, Huron and Cherokee are quite resistant. Sebago has some resistance but less than the first three.

BACTERIAL RING ROT



Bacterial ring rot is spread and carried from year to year in diseased tubers that often appear normal on the outside. During storage many of the infected tubers rot, sometimes causing serious losses.

The disease flourishes in warm dry weather. Since Newfoundland weather is seldom warm and dry, growers are not very familiar with bacterial ring rot and this is probably why many seed stocks have become infected. When a warm, dry growing season does occur, the disease flares up and causes crop loss.

The bacterial ring rot organism does not overwinter in the soil but it can live in lightly diseased tubers that survive the winter in the field. It also lives from season to season in slime from rotted tubers, which has dried on bags, containers, tools, machinery and storage bins.

The first sign of bacterial ring rot is a yellowing of the lower leaves of the potato plant late in the growing season. As the yellowing spreads to other leaves, they curl up, turn brown and die, usually from the edges inward. Though symptoms may not appear in the tubers until after harvest, often if you cut off the stem end of a potato from a wilted plant you can see a yellowish to brown rot in the starch ring. The rot, a cheesy material, can be forced out by pressing the tuber between your thumb and fingers.

control

1. *Plant only Newfoundland Approved or Certified seed potatoes* — These are guaranteed free from bacterial ring rot. At the same time, dispose of your own stock of potatoes to avoid infecting the new seed.

2. *Disinfect equipment and use new bags* — Thoroughly clean and disinfect all equipment used for handling and storing potatoes. The following disinfectants have been found effective: Germ-I-Tol 50 percent (1½ ounces in 1 gallon of water), Javex liquid and other chlorine compounds (1 part to 2 parts water), Cresanol (1 part to 9 parts water), Lestoil (full strength), and lysol (1 pint in 4 gallons of water).

Use new bags only, for packaging potatoes and other vegetables, as used bags can spread bacterial ring rot and should be avoided at all costs.

3. *Practice crop rotations* — Plants from diseased tubers that survive the winter in the field are a source of infection for a crop planted in the same field the next year. By growing potatoes on a different field each year, the disease can be eliminated if you use clean seed and carry out a complete program of sanitation.

BLACKLEG

Blackleg takes an annual toll from the potato fields of Newfoundland. The disease is carried over from year to year in the tubers produced on lightly infected plants.

The first indication of blackleg may be gaps in the potato row, where seed pieces have rotted or sprouts were killed by the disease organism. Foliage symptoms are most evident from early July to late August but can develop as late as mid-September. The diseased plants are stunted and yellowed, with the top leaflets rolled upward. The lower 1 to 5 inches of stem of infected plants is decayed by a very black, usually moist rot of the outer part of the stem. Such plants usually die without producing much of a crop.

Infected tubers show symptoms ranging from a black discoloration at the stem end to a fairly large area of rot reaching from there into the central part of the tuber. The rot is usually much blacker than that produced by other disease organisms.

control

1. *Plant only disease-free seed* — When cutting seed, discard all tubers that show any sign of decay and disinfect the cutting knife in a formalin solution (8 ounces formalin in 1 gallon of water) after cutting any diseased tubers.

2. *Treat seed potatoes with Semesan Bel* — Follow the manufacturer's instructions.

3. *Avoid early planting in cold, wet soil.*

4. *Plant resistant varieties* — Sebago and Urgenta are very susceptible to blackleg but Hunter, a variety recently introduced by the Canada Department of Agriculture, is highly resistant. Other varieties recommended for Newfoundland have moderate resistance to the disease.

MAGNESIUM DEFICIENCY

Magnesium deficiency is not caused by a living disease organism but by a lack of magnesium, one of the plant-food elements. The soils of Newfoundland are poorly supplied with this element and deficiencies have been noted in potatoes in all parts of the island.

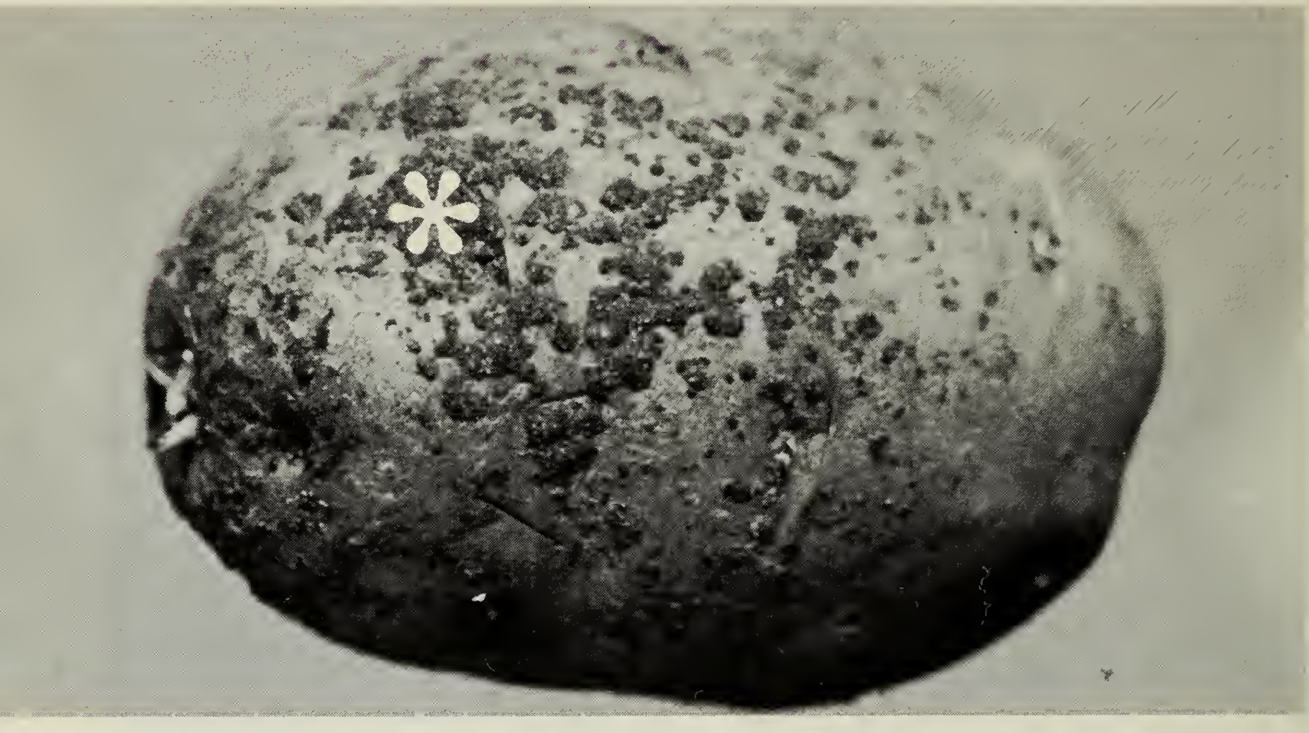
Magnesium deficiency causes poor growth and reduces yield. The lower leaves of the potato plant turn yellow and then the leaf blades between the veins brown and die. Later, the leaves drop from the stem. The yellowing and dying spread upward until only a few green leaves are left at the top of the stalk. The symptoms differ from those of bacterial ring rot in that the yellowing appears earlier in the season (July or August) and is not accompanied by pronounced wilting.

To avoid magnesium deficiency, simply use fertilizers to which magnesium has been added. These are identified by "M" after the formula, for example, 6-12-

12M. Their slightly higher cost is well repaid by improved growth and higher yields of potatoes.

Some brand names are used in this publication because the chemical names are difficult for general use and there are no official common names for the active ingredients.

RHIZOCTONIA



Rhizoctonia causes greater loss in the potato crop than is generally realized. The disease takes several forms, depending on the age of the plant when attacked. Stem canker is the most widespread and destructive form in Newfoundland, particularly on newly cleared land.

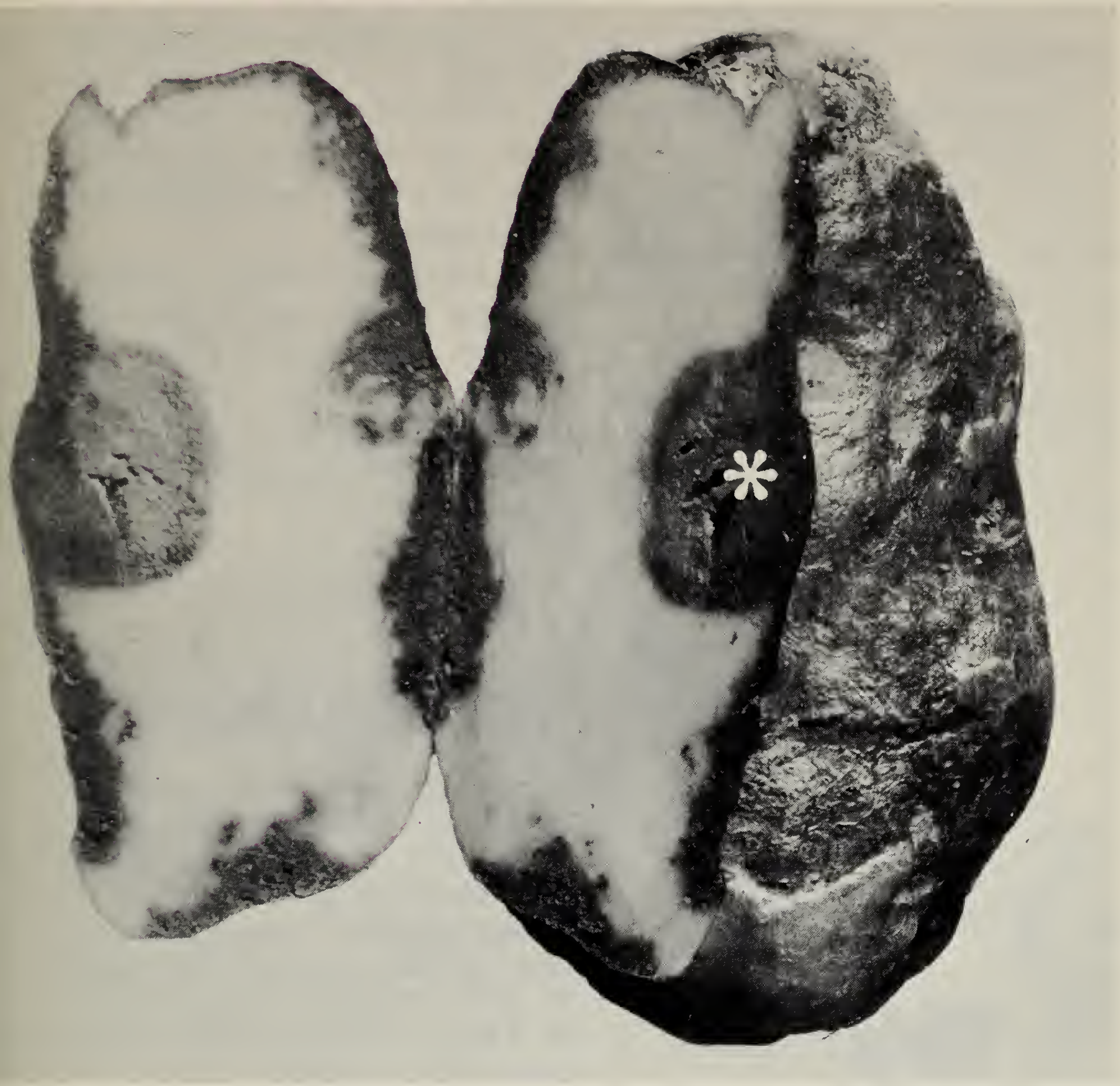
The first symptom is an upward rolling of the top leaves of the potato plant; later, small green tubers grow where the lower leaves join the stem. Rhizoctonia has some similarities to blackleg but causes less stunting and yellowing. A dry brown decay, or rot, appears at the base of the stem, partly or wholly encircling it. Such plants produce a worthless crop of small, misshapen tubers.

The disease also shows up as "black scurf" — small, black, slightly raised black spots scattered over the tubers. These can be forced off with the fingernail but cannot be washed away. Like common scab, black scurf makes potatoes unsightly and lowers the grade.

control

This disease is difficult to control and little can be recommended. Avoid seed from crops infected with rhizoctonia. Seed treatment is of little value because the causal fungus is found in most soils. Shallow planting helps to reduce injury to the sprout and to avoid stem canker.

LATE BLIGHT



Late blight, a disease of the tops and tubers, can be very destructive when the weather is right for it. For an epidemic to start, night temperatures of 50° F or above must be accompanied by damp weather during the daytime. Cold nights and dry days check the disease.

The leaves show the first symptoms — light to dark spots, ⅓ to ¾ inch across, with dark-green, water-soaked edges. On the underside of the leaf a band of whitish mold or mildew is nearly always found around the edges of the spots; this distinguishes late blight from other leaf-spotting diseases of the potato. As the disease progresses, leaves and stems turn black and die, sometimes within a very few days. Tubers are also attacked and develop a characteristic brownish-purple dry rot, ¼ to ½ inch deep. Very often, soft-rot bacteria follow the late-blight rot and cause the wet rot found in infected potato crops.

control

To control late blight, the foliage must be protected by a fungicide such as maneb, zinab or Bordeaux mixture. So it will be fully effective, spray before infection occurs and continue at weekly or 10-day intervals until harvest or until vines are killed by frost.

As an alternative, or in addition to spraying, the following cultural practices help control blight:

1. *Keep potatoes well hilled* — Blight spores from infected leaves are washed into the soil and cause tuber infection; a good covering of soil reduces such infection.
2. *Delay digging* — Do not dig potatoes until 10 to 14 days after vines die from frost or maturity. Since blight spores soon die without living leaves, spores will not be alive to infect tubers at harvesttime.
3. *Use resistant varieties* — Many of the newer varieties, such as Kennebec, Keswick, Fundy, Avon, Hunter and Sable, are immune from some forms of the late-blight organism but cannot resist other blight races that appear from time to time.

ACKNOWLEDGMENT

The information in this publication was prepared by Dr. O. A. Olsen, Experimental Farm, St. John's West, Nfld., in cooperation with Mr. G. C. Morgan, District Supervisor Commodity Inspection, Production and Marketing Branch, St. John's West, Nfld., and Dr. D. S. MacLachlan, Director, Plant Protection Division, Ottawa.

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